PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in Lubricators for Greasing the Rails of Railways and the Wheels which ride on them

We, EXECUTORS of JAMES MILLS LIMITED, a British Company, of Bredbury Steel Works, Woodley, near Stockport, in the County of Chester, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to rail and wheel flange lubricators for applying lubricant to railway and tramway rails as well as to the flanges of the wheels of the passing vehicles for the purpose of reducing frictional wear between the wheel flanges and the rails, more particularly when the vehicles are passing around sharp curves.

The invention is concerned with lubricators for the above described purpose which are of the kind comprising a lubricant feeding unit adapted for mounting in a stationary manner on the rail supporting bed, such as the ballast, and means operated by the vertical deflection of the rail consequent on the passing traffic for supplying lubricant from said lubricant feeding means to the rail, such as to the side of the rail head.

The present invention has for its primary object the provision of an improved form of lubricating device of the foregoing kind which is of particularly simple, inexpensive and robust construction and which is not likely to get out of order after quite a prolonger period of use.

With the foregoing primary object in view, the invention in its broadest aspect comprises a lubricant feeding device for the purpose above described, comprising a lubricant feeding unit adapted for mounting in a stationary manner on the rail supporting bed, said unit embodying a container for lubricant and a lubricant feeding pump, means for supplying lubricant from the pump to one of the rails at the required position thereon, a pump operating element mounted or adapted to be mounted on one of the running rails so as to project to one side thereof and adapted to be displaced in a substantially vertical direction under the vertical rail deflection consequent on the passing traffic, said pump being a reciprocating pump having a piston mounted for substantially vertical movement and connected to an actuating element mounted on the said feeding unit for reciprocatory movement in alignment with the reciprocating movement of the pump piston, the actuating element projecting externally of the said feeding unit and being adapted to be reciprocated by the vertical movement of said operating element but to be engaged releasably by said operating element, the arrangement being such that the pump can be removed from the said feeding unit and replaced when desired.

By the expression "running rail" is, of course, meant a rail which is adapted to support the vehicles which traverse the railway or tramway.

The aforesaid removal of the pump from the pump casing is preferably facilitated by constructing the operating element as a two-part member, namely, an arm adapted releasably to engage with the pump actuating element, and an attachment member for securing the arm to the rail, said arm being displaceable in relation to the attachment member as by being pivotally connected thereto for pivotal movement about a substantially vertical axis so that the arm can be displaced clear of the actuating element to permit of ready removal of the pump.

A subsidiary feature of the invention comprises the provision of a lubricator as above described with means for automatically compensating for unduly large vertical movements of the rail which might otherwise result in damage to the device in operation, as well as excessive supply of lubricant to the rail.

For example, the said operating element may comprise an arm or other member

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mounted for limited but controlled movement in relation to the rail, the arrangement ensuring that if the rail is subjected to excessively large vertical movements, these are not transmitted to the pump plunger, so as either to damage the pump or to deliver an excessive amount of lubricant to the rail which might result in slipping of the locomotive or other propelling vehicle traversing the rails.

For example, such excessive vertical movement of the rail might be produced by the passage of an exceptionally heavy load, such as, in the case of a railway, a locomotive of more than the normal weight, or it might be caused by the settlement of the rails in relation to the rail bed, for example, as a result of abnormal track sinkage or the effect of abnormal weather conditions.

For instance, the arm aforesaid may be made in two parts connected pivotally together, one part being rigid with the rail and the other part being adapted to engage with the pump plunger, a spring being provided for controlling the relative movement of the two parts, the arrangement being such that if an excessive vertical movement of the rail occurs, the pump plunger operating part is displaced in relation to the rail itself against the spring pressure.

Alternatively, the arm may comprise two parts mounted for relative friction-controlled pivotal movement, the arrangement being such that when the part of the arm which engages with the actuating element of the pump is displaced by the rail through more than a certain distance, the frictional force at the pivot between the two parts is overcome to permit of this part of the arm moving permanently into a new position without undue movement being transmitted to the pump plunger.

Alternatively, the arm may be a one-piece member of resilient configuration adapted to bend if more than a predetermined movement is transmitted to the pump actuating element.

Alternatively, the arm may be of rigid configuration, and a lost-motion spring-controlled connection may be provided between the pump actuating element and the pump piston.

The invention is illustrated in the accompanying drawings, wherein:—

Fig. 1 is a plan view of part of a railway track provided with one form of lubricator in accordance with the present invention;

Fig. 2 is a sectional view on the line 2—2 of Fig. 1;

Fig. 3 is a plan view to an enlarged scale of part of the construction depicted in Figs. 1 and 2;

Fig. 4 is a sectional view to an enlarged scale on the line 4—4 of Fig. 2;

Fig. 5 is a sectional view to an enlarged scale on the line 5—5 of Fig. 1;

Fig. 6 is a view of part of the construction depicted in Fig. 5 looking in the direction of the arrow 6 with the rail omitted.

Fig. 7 is a view similar to Fig. 5 but showing the application of the invention to a flat bottomed rail instead of the bull head rail depicted in Fig. 5;

Fig. 8 is a sectional view on the line 8—8 of Fig. 1;

Fig. 9 is a view of part of the construction depicted in Fig. 8, looking in the direction of the arrow 9 in Fig. 8 with the rail in Fig. 8 omitted;

Fig. 10 is a view similar to Fig. 2 showing a modification;

Fig. 11 is a part sectional detailed view of a modification of the arrangement illustrated in Fig. 4;

Figs. 12 and 13 are views similar to Fig. 10 showing two further modifications;

Fig. 14 is a plan view of the construction depicted in Fig. 13;

Fig. 15 is a view similar to Fig. 13 showing a further modification:

Referring firstly to Figs. 1 to 9 of the drawings, the invention is depicted as applied to the lubrication of railway rails which as shown in Figs. 2, 5 and 8 are of bull head form although, if desired, as shown in Fig. 7 they may be of flat bottomed form and as illustrated the lubricating device is arranged to feed lubricant to the inner or wheel flange engaging side of the head of one of the two running rails 15, 16, namely, the rail 15 as well as to feed lubricant to the wheel flange engaging side of a check rail 17 disposed adjacent the running rail 16.

It will, of course, be understood that the inner or flange engaging side of the head of the running rail 16 may also be lubricated in like manner to the running rail 15.

Such lubricating device comprises a feeding unit illustrated generally at 18 supported in a stationary manner upon the rail bed, for example, the ballast itself, or the subsoil of the rail bed where the overall depth of the feeding unit is substantial. Such feeding unit is preferably disposed to the side of the two rails 15, 16 completely clear of the passing traffic so as to facilitate inspection and refilling of the feeding unit with lubricant and also to avoid it being struck by trailing equipment on the passing vehicles, or being fouled by snow ploughs. It should, of course, be understood that the feeding unit may be disposed between the two running rails, such an arrangement being sometimes desirable, for example, in the case where a conductor rail is provided outside the two running rails.

This feeding unit 18 as shown most clearly in Fig. 2 comprises a vertically disposed cylindrical container 19, the bottom of which container is open and has mounted therein a filter plate 20 spaced above the base 21 of the

feeding unit so as to provide a passage 22 to a pump containing chamber 23 integral with the lubricant container 19 so as to be separated therefrom merely by a partition wall 24.

Lubricant, which is preferably in the form of semi-solid grease, is fed gravitationally into the pump containing chamber 23 by means of a weighted piston 25 vertically slidable within the cylindrical container 19, this piston being adapted to be withdrawn when refilling of the container 19 is necessary. For this purpose the piston 25 is formed with a central hole 26, the upper end of which is internally threaded to receive detachably the lower end of a lifting handle not shown. The piston is further provided with a number of air passages of which one is shown at 27 which with the hole 26 are normally closed by a disc-like valve member 28 housed within a recess on the under side of the piston and lightly spring-loaded in an upward direction into engagement with the adjacent face of the piston so that when this is moving downwardly to feed the lubricant to the chamber 23 the hole 26 and passages 27 are closed, while when the piston is withdrawn on engagement of the piston withdrawal handle within the hole to effect lifting of the piston, the valve 28 moves into the open position under the suction effect of the piston so as to permit of the free flow of air through the passages 27 to the under side of the piston, and rapid and easy withdrawal of the piston being effected despite its grease tight engagement with the walls of the container. Opening of the valve 28 may be positively effected by its engagement with the lower end of the lifting handle when this is in position.

As shown the container 19 is provided with a removable lid 29 opposite sides of which are adapted to be engaged releasably by clips 30 spring connected to the exterior of the container 19 to retain the lid 29 removably in position. Thus with the arrangement illustrated refilling of the container 19 is effected by removing the lid 29 and piston 25 and recharging the interior of the container 19 manually.

Alternatively, the container 19 which in fact constitutes a lubricant reservoir may be recharged by connecting it to a separate readily removable and, if desired, expendable container provided with a pump and lubricant feeding pipe for feeding the lubricant from such separate container to the container 19 in the manner described in our Specification No. 29561/51 and in so applying that arrangement, the pipe 18 of this prior specification would be connected to the base or lower part of the container 19 of the present specification. Withdrawal of the piston from the container with this alternative arrangement would not be necessary.

With either arrangement, provision is preferably made for readily indicating to the operator when recharging of the container 19 is necessary, and for this purpose the filter plate 20 is supported at the side thereof nearest to the partition wall 24 from a lug 31 extending therebeneath the filter plate, so that the plate is here mounted for limited pivotal movement, the opposite side of the plate being supported on its under side from one of the flanges of an angle member 32, the other flange 33 of which is engaged by spring 34 so as to force the angle member in an upward direction and normally maintain the filter plate 20 at a small inclination to the horizontal as shown in Fig. 2.

The flange 33 of the angle member 32 is connected to the lower end of an indicator release rod 35 vertically slidable in an adjacent tubular part of the container wall, the rod being normally retained by the spring 34 in a position in which its upper end 36 engages one side of an indicator plate 37, the opposite edge of which has a spring hinge connection 38 to the container lid 29.

The arrangement is such that when the container 19 is nearly but not quite empty, the piston 25 engages with the upwardly inclined filter plate 20 at the side thereof which is adjacent the angle member 32 so that further movement of the piston displaces the latter and the rod 35 downwardly to disengage the end 36 of the rod from the indicator plate 37.

The indicator plate 37 is now displaced under its spring hinge connection 38 into a substantially horizontal position in which it projects to one side of the lid 29 and displays a marking such as the word "Empty" on its upper side to indicate that recharging of the container 19 is now necessary.

Mounted detachably within the pump containing chamber 23 is a lubricant feeding pump illustrated generally at 39 and shown more particularly in Fig. 4, such pump being removably positioned within the pump chamber 23 by inserting it through a hole formed in the upper wall of the chamber 23, the pump being provided at its upper end with an attachment portion 40 which is secured detachably to the upper wall of the chamber 23 by screws 41 as shown more particularly in Fig. 3.

The attachment portion 40 is of annular form threaded internally to receive detachably a pump supporting cap 42 which is in detachable threaded engagement with the interior of the attachment portion 40 as will be apparent from Fig. 4 of the drawings. By virtue of the threaded connection between the pump supporting cap 42 and the attachment portion 40, the cap 42 together with the pump barrel 43 and the other parts of the pump 39 can very readily be removed from the container 19 without removing the screws 41.

This pump 39 is of the reciprocating

plunger type and comprises a vertically disposed barrel 43, the lower end of which carries a removable inlet valve seating 44 provided with a non-return inlet valve member 45 of the ball type, having a control spring 46.

The lower end of the barrel 43 including its inlet valve 45 extends substantially to the bottom of the pump containing chamber 23 so as normally to be completely immersed within the lubricant fed into the interior of the chamber 23 by the gravitational movement of the piston 25.

The pump barrel 43 is provided in its lower portion with a liner 47 formed integrally with the valve seating 44, in which liner 47 works the pump piston 48, which piston is of hollow form and provided at its lower end with a central opening 49 normally closed by spring-loaded piston valve 50, which piston valve is of ball form as shown. The upper portion of the piston 48 is provided with a plurality of radially extending apertures 51 and is mounted on the lower end of the pump rod 52.

The arrangement is such that when the pump rod 52 is displaced in a downward direction the piston valve 50 is caused to open against its spring-loading, the inlet valve 45 remaining closed during such downward piston movement so that lubricant is thus admitted to the hollow interior of the piston 48, while when the rod together with its associated piston moves in an upward direction the piston valve 50 closes, so that the pump then acts as a reciprocating lift pump, raising the lubricant upwardly of the pump barrel 43 and at the same time sucking further lubricant past the now open inlet valve 45 into the lower end of the pump barrel.

The stroke of the piston 48 is very small, being substantially less than the length of the liner 47 and the piston is normally maintained in its upper position by a return spring 53, upward movement of the piston being limited by providing the pump rod 52 with a collar 54 which engages the under side of the cap 42.

The upper end of the pump barrel 43 is connected detachably to the said supporting cap 42 which supporting cap with the attachment member 40 together constitutes a lubricant distributing head, indicated generally at 55 and provided internally with lubricant distributing passages 56 which are in communication with the interior of the upper end of the barrel 43.

The distributing head 55 is provided with a by-pass passage 57 which communicates with the upper end of the interior of the barrel 43, this by-pass passage being adapted to be partially closed by a by-pass valve member 58 which is threadably mounted within the interior of the distributing head, the arrangement being such that when this by-pass valve member is fully withdrawn, the by-pass passage 57 is fully open so that in these circumstances the major portion of the lubricant displaced up the pump barrel returns through the by-pass passage 57 to the interior of the top of the chamber 23, while when the valve member 58 is displaced inwardly of the head 55 to the fullest extent, the lubricant so displaced is then fed to the distributing passages 56. Thus the amount of lubricant fed to the distributing passages 56 for a given stroke of the pump may be regulated.

Two lubricant distributing passages 56 are provided in the lubricant distributing head 55 of the pump, one of which passages is connected directly to one end of a flexible pipe 59 which is in turn connected to a lubricant applicator mounted on one of the rails and not shown in the drawings, and the other of which passages 56 has a "T" connection 60 to a pair of further flexible distributing pipes 59, one of which pipes is connected to a running rail lubricant applicator 61 mounted on running rail 15 and the other of which is connected to a check rail lubricant applicator 62 mounted on the check rail 17.

The running rail lubricant applicator 61 is shown in Figs. 5 and 6 and comprises a member 63 of "L" shape in cross-section, the longer flange 64 having a length substantially less than the overall depth of the rail and extending from a position adjacent one side of the rail foot 65 to a position spaced beneath the rail head 66, with the shorter flange 67 of the member 63 extending beneath the head into engagement with the web 68.

There is thus provided between the two flanges of the "L" shaped member 63, the rail foot 65 and the web 68 at one side of the rail, namely, the inner side, a lubricant receiving chamber 69, the two ends of which are closed by end closure members 70, one of which is depicted in Fig. 6, the parts as so far described being secured in position by two limbed clips 71 spaced at intervals along the length of the "L" shaped member 63, the longer limb 72 of each clip extending beneath the rail foot 65 and the shorter limb 73 engaging with the upper side of a projection 74 integral with the lower end of the flange 64.

The upper side of each clip limb 73 carries a nut 75 in which works a clamping screw 76, the inner end of which engages within a corresponding recess in the outer side of the flange 64 and it will be appreciated that the effect of tightening the screw is to force the "L" shaped applicator member 63 towards the rail web and foot and at the same time force the longer limb of the clip 71 into engagement with the under side of the rail foot 65 through the medium of the packing piece 77. Such movement of the lower part of the applicator member 63 towards the rail is

limited by pins 78 carried by the applicator member flange 64 at positions adjacent each clamping screw 76, and flexible sealing strips 79 are provided to maintain the requisite liquid tightness to the chamber 69 as shown more particularly in Fig. 6.

To the outer side of the upper portion of the applicator member flange 64 is secured a flexible thin metal tongue 80 which extends for the full length of the applicator 61, the tongue being so shaped as to have its upper edge 81 spaced away from the adjacent side of the rail head 66 as well as disposed at a position somewhat below the upper surface of the head and this tongue 80 forms with the adjacent under side of the rail head 66 and the applicator member flange 67, a lubricant applying chamber 82 to which lubricant can be fed from the chamber 69 through holes 83 in the said flange 67.

The lubricant is supplied through one of the said distributing pipes 59 to the lubricant receiving chamber 69 through an adjustable valve 84 and this valve enables the proportion of lubricant fed to the running rail to be varied in relation to that fed to the check rail 17 irrespective of the setting of the by-pass valve member 58, the valve 84 communicating with the interior of the chamber 69 through a hole in the applicator member flange 64 not shown.

As will be clear from Fig. 5 the upper edge 81 of this applicator tongue 80 is adapted to be engaged by the flange 85 of each passing vehicle wheel, thereby forcing the upper edge of the tongue towards the rail head and squeezing lubricant in the gap or space between the tongue 80 and the side of the rail head past the upper edge 81 of the tongue into contact with the adjacent side of the rail head and passing wheel flange, thereby lubricating these two parts each time a wheel passes in contact with the tongue as above described.

In Fig. 7 is depicted the manner in which the applicator 61 would be mounted upon a running rail of flat bottomed as opposed to bull head configuration and as will be apparent from the drawing, the only modification necessary is to provide clips 71 of slightly different shape, and since these clips with their associated clamping screws 76 are entirely separate from the applicator member 63, it will be appreciated that it is a simple matter to apply the applicator 61 to a bull head or a flat bottomed rail, such ready interchangeability arising from the design of the running rail applicator above described.

Referring now to Figs. 8 and 9 of the drawings, the check rail applicator 62 there illustrated is required to feed lubricant to the side of the check rail head which is adjacent to the associated running rail 16, and to permit of this and the applicator being readily mounted in position, this is so constructed as to be adapted to feed the lubricant across the top of the check rail head from the side thereof remote from the adjacent running rail 16.

Accordingly this check rail applicator comprises applicator member 63 of "L" form in cross-section as in the case of the running rail applicator 61 but having its two flanges 64 and 67 of substantially larger dimensions so that the shorter of these two flanges 67 can extend over the top of the check rail head for nearly the full width thereof.

The applicator member 63 is secured detachably to the check rail in manner similar to the running rail applicator member and the lubricant receiving chamber 69 to which one of the distributing pipes 59 is connected similarly through adjustable valve 84 is in this case formed on its upper side by a strip metal member 86 of inverted channel configuration. This strip metal member extends for substantially the full length of the applicator 62 and is supported at its two ends from the end closure members 70 provided as in the case of the previous construction.

This strip metal member 86 has its two longitudinal edges in contact one with the adjacent rail web 68 and the other with the inner side of the applicator member flange 64.

In order to allow passage of the lubricant between the inner surface of the two applicator member flanges and the rail head, a pair of spacing members 87 are provided, these members being formed of metal strip and being spaced longitudinally of the applicator so as to engage between the rail head and the adjacent surface of the applicator member.

Accordingly when lubricant is fed to the lubricant receiving chamber 69 is passes through holes 83 provided in the channel strip 86 and corresponding to the holes 83 of the construction shown in Fig. 5, the lubricant then passing similarly to the lubricant applying chamber 82 whence it passes through the space provided by the two spacing strips 87 to the free edge 88 of the flange 67 so as there to lubricate the outer side of the passing wheel flange 85 and the adjacent side of the check rail head in contact therewith.

Lateral adjustment of the upper part of the applicator member relative to the check rail head is provided by the adjusting screws 89 and for strengthening purposes the two end closure portions 70 may as shown be joined by the longitudinally extending rod 90.

The pump 39 is adapted to be operated by the vertical deflection of one of the two running rails consequent on the passing traffic, namely, in the arrangement illustrated in Fig. 1 by the running rail 16 and for this purpose the upper end of the pump rod 52 is provided as shown in Fig. 4 with an actuating element 91 which extends slidably through a hole in

the pump supporting cap 42 so as to be capable of reciprocating in alignment with the reciprocatory movement of the pump piston and this actuating element 91 projects above the cap 42, and its upper end 92 which is of domed configuration is adapted to be engaged by the under side of an operating element indicated generally at 93 and mounted on the outer side of the rail 16 at a position adjacent to the feeding unit 18.

As shown most clearly in Fig. 2 this operating element comprises an attachment member 94 constructed as a bracket of channel configuration, one limb of which is secured by a number of bolts 95 to the rail 16 and to the other limb of which is connected one end of an operating arm 96, the free end 96c of which is adapted to engage with the pump actuating element 91 and the arrangement is such that when the rail 16 is displaced downwardly under the weight of the passing traffic, carrying with it the operating element, the actuating element 91 is also displaced so as to effect downward displacement of the pump piston 48 to supply lubricant to the interior thereof, actual upward delivery of the lubricant through the lubricant distributing passages 56 and flexible pipes 59 to the lubricant applicators occurring during the upward movement of the rail when the pump piston moves upwardly under the action of the spring 53.

With the particular arrangement illustrated provision is made for ensuring that an unduly large downward movement of the rail 15 is not transmitted to the pump piston so as either to damage the pump or to cause during its return stroke an unduly large quantity of lubricant to be fed to the rail heads with consequent possible slipping of the locomotive or other propelling vehicle.

Such undue downward displacement of the rail may occur as a result of an abnormally heavy load or as a result of a downward settlement of the rail relative to the rail bed as is liable to occur from time to time with any railway.

Accordingly, the arm 96 of the operating element has a hinge connection illustrated at 97 to the attachment member 94, the axis of hinging being horizontal and longitudinal of the rail and at a position beneath the hinge the arm 96 is provided with a dependent lug 98 having an opening 99 through which extends freely a bolt 100 adjustably and threadably mounted on the attachment member 94, the bolt carrying a compression spring 101 which engages between the bolt head and the said operating element lug 98.

The arrangement is such that if the rail 16 is displaced downwardly by more than a predetermined distance, the under side of the domed end or head 92 of the actuating element 91 engages with the upper side of the cap 42, thus precluding further downward displacement of the pump piston 48, and then as further downward movement of the rail 16 occurs, the operating arm 96 pivots upwardly in relation to the attachment member 94 compressing the spring 101 in so doing without the arm 96 being in any way damaged, or an undesirably large force being applied to the pump actuating element 91, no further movement being of course transmitted to the pump piston. The operating arm 96 returns to its normal position when the rail 16 also returns to its normal position.

In order to facilitate ready removal of the pump 39 for cleaning and inspection as is in practice necessary from time to time, the operating arm 96 is made in two parts, namely, the inner part 96A associated with the hinge 97 aforesaid and an outer part 96B which engages with the actuating element 91, and these two parts are connected pivotally together by vertically extending pivot bolt 102 so that the outer part 96B can be turned about the axis of such pivot bolt to bring its free end clear of the pump and permit of this being withdrawn merely by unscrewing the pump supporting cap 42 from the attachment part 40 without displacing to the slightest degree the feeding unit 18 as would otherwise be necessary to bring the pump clear of the operating arm 96.

In Fig. 10 is shown a modified form of operating element 93 in which no provision is made for excessive downward movement of the rail, this operating element being made in two parts only, namely, a rigid operating arm 96 for engaging with the pump actuating element, and an attachment member 94; the two parts being connected together by a vertically extending pivot bolt 102 so as to permit of the arm 96 being turned into a position in which it is clear of the pump 39 as in the case of the preceding construction.

In Fig. 11 is depicted an arrangement for allowing for undesirable downward movement of the rail even though the operating element 93 may as shown in Fig. 10 be of rigid construction. For this purpose as shown in Fig. 11 a lost motion connection is provided between the actuating element 91 and the pump rod 52 by connecting the upper end of the pump rod to a cylindrical sleeve member 103 having limited vertical sliding movement within the pump supporting cap 42 in like manner to the element 91 depicted in Fig. 4, and the actuating element proper is slidable within this sleeve member 103 with a relatively stout compression spring 104 being provided between the actuating element and the sleeve member so that if an unduly large downward movement is applied to the rigid operating element 93, this movement can be taken up by compression of the spring 104.

In Fig. 12 is illustrated a modification of the arrangement shown in Fig. 2 in which

instead of connecting the arm 96 pivotally to the attachment member 94, the arm 96 is formed as a length of resilient metal strip connected rigidly to the attachment member through the medium of the pivot bolt 102, the resilient strip being adapted to flex in an upward direction when more than a predetermined downward movement is transmitted thereto from the rail, while at the same time the strip metal arm 96 can be pivoted clear of the pump to facilitate pump removal as in the case of the preceding constructions by virtue of the pivot bolt 102.

In Figs. 13 and 14 is depicted a further modification in which the operating element 93 embodies an operating arm 96 of rigid construction, which arm is however pivoted at 105 about an horizontal axis longitudinal of the rail to an intermediate part 106 itself pivoted through pivot bolt 102 about a vertical axis to the attachment member 94 as in the preceding constructions, and in this arrangement the operating arm 96 is provided with a pair of friction pads 107 which engage with the intermediate part 106 and permit of the arm 96 pivoting into a new permanent angular position relative to the rail if the rail should move downwardly through more than a certain distance in relation to the rail bed. The arrangement shown in Figs. 13 and 14 in fact operates in exactly the same way as that shown in Fig. 2 except that the arm 96 does not return to its initial position in relation to the rail if excessive downward movement of the rail occurs.

In Fig. 15 is shown a modification of the arrangement shown in Figs. 13 and 14, in which the operating arm is made in two parts, namely, an inner part 96C carrying the friction pads 107 and engaging frictionally with the intermediate part 106, and an outer part 96D formed of resilient metal strip as in the case of the construction depicted in Fig. 12 and connected rigidly at its inner end to the inner arm part 96C, the arrangement is such that if a moderately excessive downward movement of the rail occurs, the arm part 96D flexes in relation to the inner arm part 96C, while if a very substantial downward rail movement takes place, the upper side of the outer part 96D of the operating arm then engages with an abutment 108 on the inner part 96C causing the latter then to pivot relative to the intermediate part 106 as in the case of the construction last described.

Preferably as shown at 109 a spring connection is provided between the outer arm part 96D and the inner arm part 96C for controlling the movement of the outer arm part in relation to the inner arm part.

It will of course be understood that, if desired, only one or a relatively large number, namely, more than three lubricant applicators may be operated from the one feeding unit, the number of applicators so operated being dependent on the particular lay-out and location of the rails and the density of the passing traffic.

The present invention provides a device for feeding lubricant to a rail such as a railway rail, as illustrated, so as to lubricate the head thereof and the flanges of the passing vehicle wheels, which device is of a particularly simple construction, and insofar as the feeding unit is mounted on the rail bed, the feeding unit itself is not displaced at all during the operation of the device so that it is not subjected to the vibration of the passing traffic. At the same time provision is made for removing the pump 39 from the feeding unit for the purpose of cleaning or inspection without it being necessary to disturb in any way the position of the feeding unit, or to remove the operating element 93 from the rail.

Further with the particular construction above described, the lower end of the pump 39 including the inlet opening and inlet valve thereof 45 is housed within a chamber connected integrally with the lubricant container 19, a direct connection through the opening below the partition wall 24 being provided between the interior of the container 19 and the pump containing chamber 23 so that special pipes for feeding the lubricant from the lubricant container to the pump are avoided, and at the same time the lower end of the pump is permanently immersed in the lubricant so that the valves thereof and other vital moving parts of the pump are effectively protected.

What we claim is:—

1. A rail lubricator for the purpose described, comprising a lubricant feeding unit adapted for mounting in a stationary manner on the rail supporting bed, said unit embodying a container for lubricant and a lubricant feeding pump, means for supplying lubricant from the pump to one of the rails at the required position thereon, a pump operating element mounted or adapted to be mounted on one of the running rails so as to project to one side thereof and adapted to be displaced in a substantially vertical direction under the vertical rail deflection consequent on the passing traffic, said pump being of reciprocating form having a piston mounted for substantially vertical movement and connected to an actuating element mounted on the said feeding unit for reciprocatory movement in alignment with the reciprocating movement of the pump piston, the actuating element projecting externally of the said feeding unit and being adapted to be reciprocated by the vertical movement of said operating element but to be engaged releasably by said operating element, the arrangement being such that the pump can be removed from the said feeding unit and replaced when desired.

2. A lubricator according to Claim 1, wherein the operating element comprises an arm adapted releasably to engage with said pump actuating element, and an attachment member for securing the arm to the said rail, said arm being displaceable in relation to the attachment member to permit of it being displaced clear of the pump actuating element and pump so as to facilitate removal of the pump from the feeding unit.

3. A lubricator according to Claim 2, wherein the said operating element arm is mounted for pivotal movement about a substantially vertical axis in relation to the said attachment member.

4. A lubricator according to any of the preceding claims provided with means adapted to prevent more than a predetermined vertical deflection of the rail being transmitted to the piston of the reciprocating lubricant feeding pump.

5. A rail lubricator comprising a lubricant feeding unit adapted for mounting in a stationary manner to one side of a railway or tramway track clear of the passing traffic, said feeding unit comprising a container for lubricant, a reciprocating type lubricant feeding pump having a piston mounted for substantially vertical movement, a weighted lubricant feeding piston within said container adapted to feed lubricant from said container to said pump, means for distributing lubricant from the pressure side of the pump to the desired position on one or more rails, a pump operating element mounted or adapted to be mounted on one of the running rails so as to project to one side thereof and adapted releasably to engage with an actuating element mounted on the feeding unit for reciprocatory movement in alignment with the pump piston, and adapted to transmit reciprocatory movement to said piston, said pump being removable from said feeding unit, and means being provided for preventing more than a predetermined vertical deflection of the rail being transmitted through said operating element to the pump piston.

6. A lubricator according to Claim 4 or 5 wherein the operating element comprises an arm mounted for spring-controlled pivotal movement in relation to the rail on which it is mounted, the arrangement being such that if more than a predetermined downward displacement of such rail occurs, the arm pivots against this spring loading in relation to such rail without further movement being transmitted to the pump piston.

7. A lubricator according to Claim 4 or 5 wherein the operating element comprises an arm mounted for friction-controlled movement in relation to the rail on which it is mounted, the arrangement being such that for normal vertical deflections of such rail, the rail movement is transmitted to the arm without the arm being displaced in relation to the rail, while if an excessive movement of the rail occurs, the arm moves relatively to the rail against its friction control into a new position in relation to the rail without such excessive movement of the rail being transmitted to the pump plunger.

8. A lubricator according to Claim 4 or 5 wherein the operating element comprises an arm mounted for spring-controlled movement in relation to an intermediate part having a friction- controlled pivoted connection to the rail on which said operating element is mounted with the axis of said pivoted connection being substantially horizontal, the arrangement being such that if moderate abnormal vertical rail deflections occur, the arm is displaced to the intermediate part against its spring loading without the intermediate part being itself displaced in relation to the rail, while if excessive vertical movements of the rail take place, the intermediate part is itself displaced in relation to the rail into a new position against its friction loading, carrying with it the said arm.

9. A lubricator according to Claim 4 or 5 wherein a lost-motion spring-controlled connection is provided between the pump actuating element and the pump piston, the arrangement being such that if an excessive vertical displacement of the rail occurs, relative movement takes place between the actuating element and the pump piston without such excessive movement being imparted to the pump piston itself.

10. A lubricator according to Claim 4 or 5 wherein the actuating member comprises an inherently resilient arm of sufficient strength to actuate the pump, the arrangement being such that when the member is displaced through the limit of movement required to actuate the pump, it will yield in response to continued deflection of the rail.

11. A lubricator according to any of the preceding claims, wherein the pump comprises a barrel in which the pump piston is vertically slidable, the barrel having an inlet opening at its lower end, and the lower end of the barrel being adapted *in situ* permanently to be immersed in the lubricant within the feeding unit so that the lubricant is fed directly from the container to the pump without passing through intervening pipes.

12. A lubricator according to Claim 11 wherein the feeding unit comprises a pump receiving chamber separated from said container by a partition providing an opening directly between the lubricant container and the pump receiving chamber.

13. A lubricator according to any of the preceding claims, wherein the pump has associated therewith a by-pass circuit provided with an adjustable control valve, the arrangement being such that when the valve is fully open, a greater proportion of the lubricant delivered by the pump passes around the by-

pass circuit, and a lesser proportion is supplied to the or each rail, partial closure of the by-pass valve being adapted to cause a greater proportion of the pump-delivered lubricant to be fed to the rail or rails.

14. A lubricator according to any of the preceding claims wherein the feeding unit container embodies a weighted piston adapted gravitationally to feed lubricant from the feeding unit container to the pump piston, said weighted piston being removable from its container for the purpose of effecting manual recharging of the container, said piston being provided with means adapted to permit of it being manually lifted and having further an opening extending therethrough adapted to permit of the free flow of air to the under side of the piston during its lifting, said opening being provided with a valve member adapted to close the opening during the normal operation of the piston but to move automatically into the open position when the piston is lifted to effect its removal from the container.

15. A lubricator according to any of Claims 1 to 13 provided with means for feeding lubricant to the container of said feeding device from a separate container as described and claimed in Specification No. 29561/51.

16. A lubricator according to any of the preceding claims wherein the feeding unit container embodies a weighted piston adapted gravitationally to feed lubricant from the feeding unit container to the pump piston, said weighted piston being adapted as it approaches the lower end of its travel corresponding to nearly empty conditions of the container to operate means for displacing an indicating member into a position for indicating that replenishment of the feeding unit container is necessary.

17. A lubricator according to any of the preceding claims having means for distributing lubricant to a running rail to be lubricated, comprising an applicator consisting of a member mounted on one side of such rail adjacent the web thereof and adapted to provide in conjunction with the web a lubricant receiving chamber, means for feeding lubricant from the pump to said chamber, a thin metal tongue being mounted on said applicator member so as to project thereabove with the upper edge of the tongue in proximity with the rail head, said applicator member being adapted to discharge lubricant from said lubricant receiving chamber to the space between said tongue and the rail head, said tongue being adapted to be pressed towards the rail head to be lubricated by the engagement therewith of the flanges of the passing vehicle wheels, so as thereby to force lubricant into the space between the wheel flange and the adjacent rail head.

18. A lubricator according to any of Claims 1 to 16 having means for distributing lubricant on the head of a check rail, said lubricant distributing means comprising an applicator member of angle form in cross-section mounted on one side of the check rail with one of the flanges thereof extending substantially vertically at the side of the check rail which is remote from its associated running rail and the other flange projecting above the head of the check rail towards the adjacent running rail, said dependent flange co-acting with the adjacent side of the check rail in providing a lubricant receiving chamber, means for supplying lubricant from said pump to said chamber, and each of said two applicator member flanges being spaced away from the adjacent surface of the check rail head so as to permit of lubricant being fed through such space from said chamber to the side of the check rail head which is nearest to the adjacent running rail to lubricate the flanges of passing vehicle wheels on the side of such flanges which are directed towards the check rail.

19. A lubricator according to Claim 17 or 18 wherein each applicator member is secured detachably to its associated rail through the medium of a plurality of two-limbed clips; one limb being adapted to extend beneath and engage with the rail foot and the other limb being adapted to engage with said applicator member, said other limb carrying also an adjustable clamping screw for applying clamping pressure to the applicator member, the arrangement being such as to permit of the same applicator member being used with rails of varying form in cross-section.

20. A rail lubricator substantially as hereinbefore described with reference to and as shown in Figs. 1 to 6 and 8 and 9, or 7, or 10, or 11, or 12, or 13 and 14, or 15 of the accompanying drawings.

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PROVISIONAL SPECIFICATION

Improvements in Lubricators for Greasing the Rails of Railways and the Wheels which ride on them

We, Executors of JAMES MILLS LIMITED, a British Company, of Bredbury Steel Works, Woodley, near Stockport, in the County of Chester, do hereby declare this invention to

be described in the following statement:—

In our previous patent specifications Nos. 481,194 and 622,454, lubricators are described which comprise cylindrical containers for grease attached to the rail being greased; the containers are provided with pistons for the purpose of urging the lubricant towards the inlet valves of reciprocating pumps which are actuated—in the case of the first mentioned specification, directly by the overhanging treads of the vehicle wheels and in the case of the second specification by the vertical oscillation of the rail under the weight of passing vehicles.

It has been found in practice that certain disadvantages are inherent in lubricators which are attached to the rails, notably they are limited in capacity, by their diameter if they are disposed horizontally and by their height if vertically, due to the limited space existing between the level of the top of the rails and the ballast on which the track is laid. A further disadvantage is the liability to breakage due to the vibration of the rail to which the lubricator is attached.

In the present specification means are described for constructing lubricators with the grease containers and the reciprocating pumps located in the road bed and for actuating the pumps either by the passage of the wheel tread over the rail or by the deflection of the rail and in connection with both these alternative actuating means devices are described for maintaining the amount of grease pumped per stroke reasonably constant in spite of the usual variation in the amplitude of the rail deflection under passing vehicles.

The manner in which this invention is carried out is shown in the following description and accompanying drawings of which Fig. 1 is a cross section of the grease container with pump and actuating finger attached to the rail. Fig. 2 is a plan view of Fig. 1 which shows also grease applicators fixed to the rail. Figs. 3 and 3A are sections of the grease applicators showing the grease inlets from the pump facing in alternative directions. Fig. 3B shows a grease applicator for check or guard rail also with grease connections suitable for pumps situated on either side of the rail. Fig. 4 is a sectional elevation of my preferred type of pump. Figs. 5A, 5B, 5C and 5D show the alternative forms of the fingers which are fixed to the rail and actuate the pumps by the movement of the rail. Fig. 6 shows means for actuating the pump by utilising the overhanging flange of the rail to indirectly impart a vertical movement to the pump plunger and at the same time render ineffective the vertical displacement of the rail. Referring to the figures—In Figs. 1 and 2, (1) is the cylindrical container for grease, this is provided with a trunk (2) communicating at its lower extremity with cylindrical part 1, the top of trunk 2 is provided with a flange or seat (3) on to which is mounted reciprocating pump assembly (4) in the lower extremity of which is located the pump proper with its valves and piston, to be later more fully described with reference to Fig. 4.

In cylinder 1 is advantageously located a gauze filter (5) and freely sliding in it is a heavy piston (6) which is withdrawn to permit filling the container with grease, the plunger is provided with a screwed hole (7), for the attachment of a lifting handle, the latter has an extension which automatically pushes open air release valve (8) to permit the plunger being withdrawn for refilling. Cover (9) is held in place by spring clips.

The pump (4) in its preferred form has a metal portion (10) which is external to the trunk and which is bored vertically to receive tappet (11). This may have a head (12) of larger diameter for the purpose of preventing the tappet being pushed down too far. The underside of the head may be arrested by the top surface of the bored out casting or by the adjustable collar (14). The tappet (11) is held up to the top limit of the pump stroke by the coil spring (15). Fixed to tappet (11) is tapper rod (16), to the lower end of which is located delivery valve (18), the tappet rod (16) may conveniently extend into the delivery space (19) and serve as a stop limiting the lift of valve (18); it may also contain a small valve spring (18a).

The suction valve (21) is located in the bottom of pump cylinder (22). Spring (23) controls the lift of the ball. The grease after passing the two valves arrives at space (19), thence passes through apertures (24) and upwards along tube (25), through holes (26) into annular space (27), from whence it passes through one or more outlets (28) to the nipples or connections (29) leading into the grease distributing box and applicator, to be further described. Regulation of the amount of grease delivered to the rail on the passing of each vehicle wheel over that part of the rail carrying the actuating finger (30) is effected by diverting back into trunk (2), a portion of the total amount pumped, this can conveniently be done by screw (31) which, when withdrawn, more or less from seating (32) permits some of the grease in annular space (27) to escape through by-pass opening (33), and re-enter the grease container.

The maximum amount delivered by a pump with a bucket of any given diameter will, of course, vary with the length of stroke although not necessarily in strict proportion. Where no steps are taken to neutralise part of the movement of the finger (30) the stroke will be equal to the vertical oscillation of the rail when the finger is attached thereto or the amount which the tip of the lever (34) projects above the surface of the rail table

when the actuating means is the tread of the wheel, modified, of course, by the length of any lever arms employed in transmitting the movement from part (34) to finger (30).

The simplest form of finger (30) shown at Fig. 5A is of rigid construction, is fixed to the rail and moves with it, the vertical movement of tappet (11) and consequently the stroke of the pump is equal to the vertical oscillation of the rail. The finger (30) as modified in Figs. 5B, 5C and 5D is made to yield when the free movement of the tappet is restricted by, for example, the oversailing head (12) which is located a pre-determined height above the abutment (13) or an intervening and adjustable abutment (13*a*). The finger is so constructed that it is strong enough to impart a delivery stroke to the pump, but flexible enough to yield momentarily when the tappet reaches the downward limit of its stroke. A suitable arrangement is shown at Fig. 5B, alternatively, an excessive amount of rail deflection beyond that required can be corrected by the type of yielding finger shown at 5C, in which the finger is entirely of rigid materials but constructed in such a way that it is pivotably mounted at (35) and provided with friction pads (36) or their mechanical equivalent which will yield and allow the finger to move up to a new position should the rail develop excessive slack or a permanent settlement *vis-a-vis* the pump tappet head (12). The alternative at Fig. 5D shows a combination of the yielding elements of 5B and 5C, in this the elastic or spring loaded finger (30) is hinged on or fastened to the friction held element (35-36) and held thereto by a spring which yields when the pump tappet reaches the end of its stroke and moves upwards until it meets stop (36*a*) formed on the friction element (35-36) which is rotated to a new position by any further movement of the rail.

As an alternative to the actuating fingers described above and shown at Figs. 5A, 5B, 5C and 5D which derive their motion from the deflection of the rail we may use those shown at 6A, 6B and 6C and 6D in which a lever (34) is pivotally mounted upon a bracket or anchor attached to the rail, the spindle (40) rotates with a slight angular movement and imparts this rotary movement to a spindle (41) co-axially mounted on the grease container (1) embedded in the track, and this latter spindle has mounted upon it the finger (30). It is clear that when a vehicle wheel passes over the track where the actuating finger is located, there will be a movement of the lever (34) with regard to the rail and a further movement of the rail with the actuating device. In order not to impart a cumulative effect of these two movements to the finger (30) the spindle (41) is so mounted that only the rotary movement due to the depression of lever (34) is imparted to it, this is achieved in the case of the arrangement shown at Fig. 6B by interposing a flexible coupling (42) between the two spindles (40 and 41) and in the case of (6D) by making lever (34) rocking on pivot (40) and finger (30) mounted on spindle (41) both in the form of a bell crank, the vertical arms of which are in engagement. It is clear that when the rail is depressed, it will cause the pin or the like (44) to engage the vertical arm of the bell crank at a slightly lower point, and thus affect the leverage or relative length of the two engaging arms. The effect of this variation is negligible upon the stroke of finger (30) and the pump. Suitable arrangements for applying to the rail face and wheel flange, the grease delivered by the pump are shown at Fig. 3, 3A, 3B and 3C. In Fig. 3 and 3A there is hollow channel like box member (43) which is held into the fishing space of the rail by ordinary bolts or screws such as (44) or partly by such bolts and partly by special bolts such as (45) which are hollow tubes, the external part (29) of which serves for the attachment of flexible tubes (46) through which grease passes from the pump to the applicator. The channel section member (43) is preferably divided vertically into two or more compartments (47 and 48) which serve as chambers in which the grease expands and distributes itself along the length, suitable holes (49 and 50) spaced so as to effect an even distribution of the grease when it reaches space (51) formed by top of box (43), the underside of rail head and a thin metal tongue (52) which is fixed to box (43) and extends upwards into the acute angle formed by the vertical face of the rail and the wheel which bears against it. The tongue (52) is so mounted that a slight gap is left between its top edge and the rail face to allow of the escape of grease into the angular space. In operation the flange of the wheel bears against the tongue (52) which tends to be rolled or pressed into the contour of the bearing face of the wheel flange.

Fig. 3B shows a suitable arrangement for greasing the face of a check rail and the back of the wheel flanges which bear against it. A box (53) for the expansion and distribution of the grease is continued vertically upwards on the face of the rail remote from that against which the flange bears and projects across the top of the rail to the face which it is required to grease. Alternative means are shown for delivering the grease into the expansion box or applicator (53) the short nipple (29*a*) being used when the lubricator with its pump is located between the running rails and the long hollow nipple (29) when the lubricator is placed outside the track.

The arrangement shown at 3C is particu-

larly suitable in cases where the lubricant container with its pump and actuating finger is situated outside the rail, that is to say, remote from the rail face being greased. This alternative form lends itself to construction from standard rolled steel sections—for instance channels; one length 55 is placed in the hollow of the rail on the inside of the rail and carries greasing tongue (52). On the outside of the rail is a similar length of channel (56) having nozzle or the like for the inlet of grease from the pump, the two lengths are held up to the opposite sides of the rail web by bolts (57) passing through holes (58) which may usefully be much larger than the diameter of bolt (57) so that an annular space is left through which grease from first expansion chest (56) can move into second expansion chest (55), thence through holes 50 into space (51) between underside of rail head to grease applicator (52), as shown on Figs. 3, 3A, 3B and 3C.

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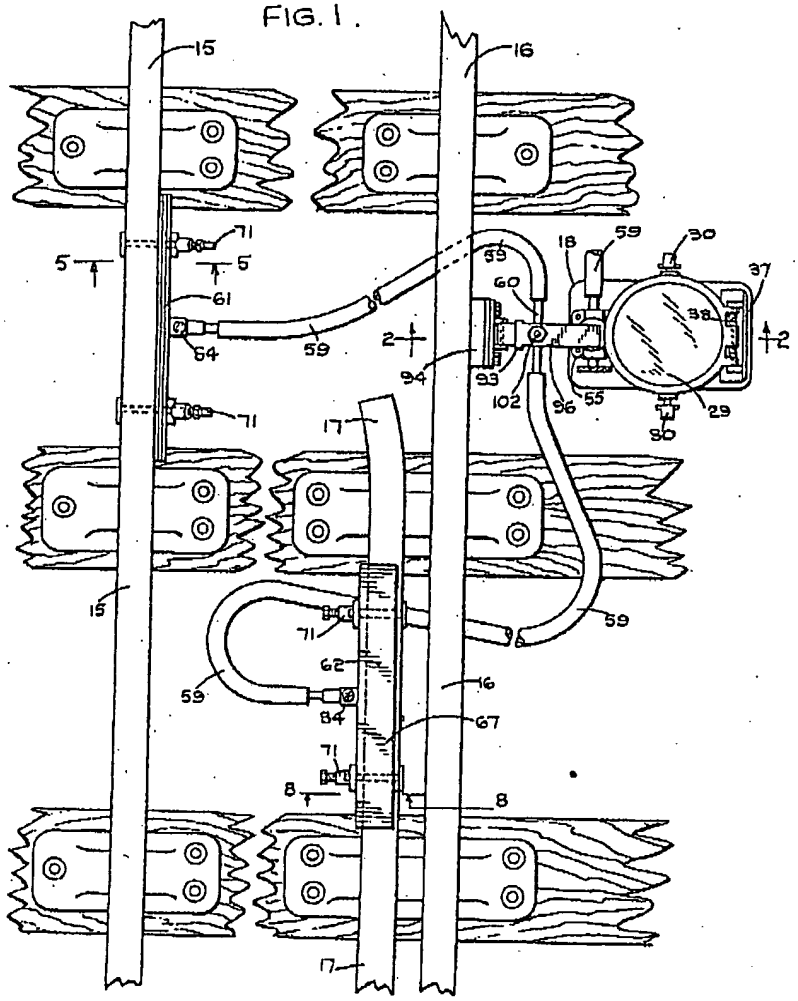
FIG. 1.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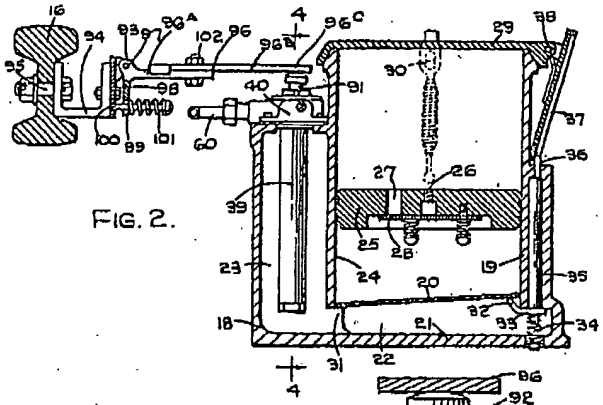

FIG. 2.

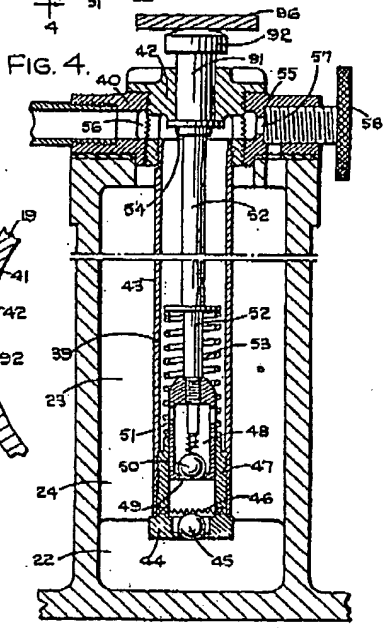

FIG. 4.

FIG. 3.

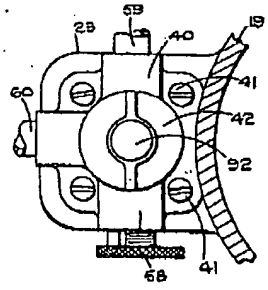

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FIG. 5

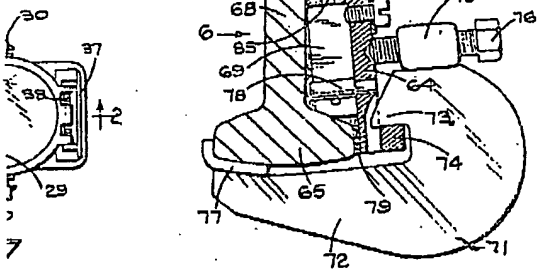
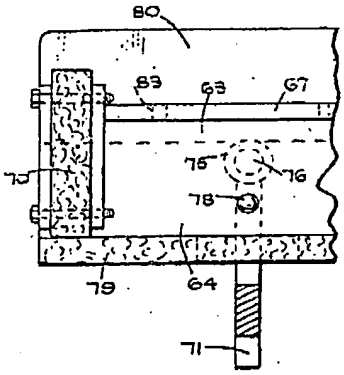


FIG. 6.



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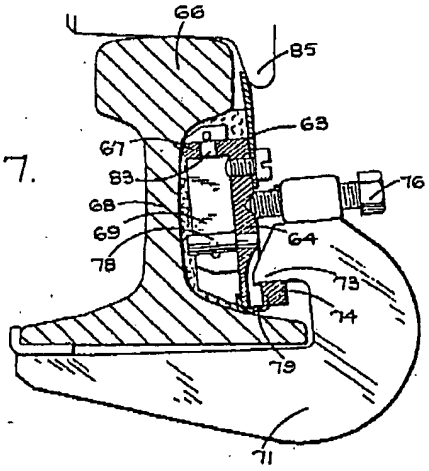

FIG. 8.

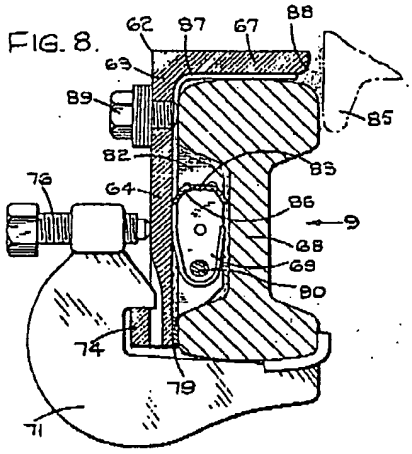
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FIG. 9.

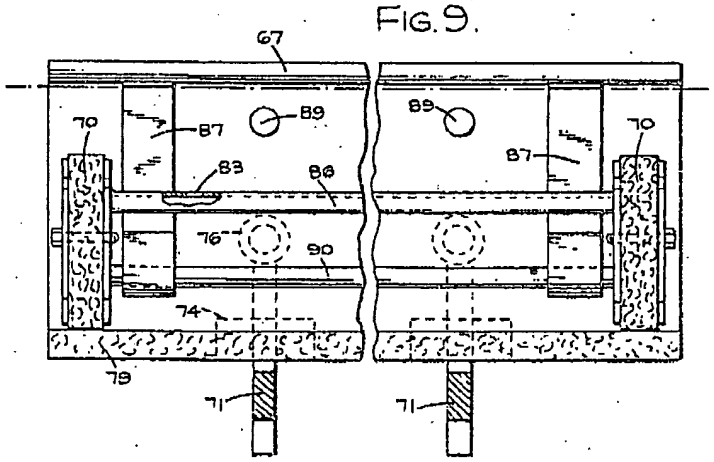
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FIG 10.

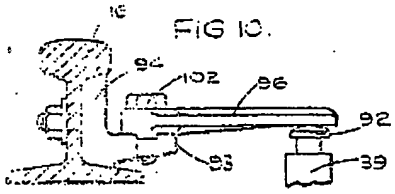


FIG. 12.

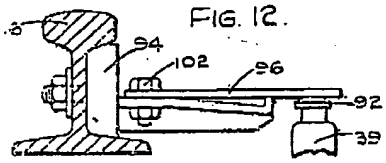


FIG. 13.

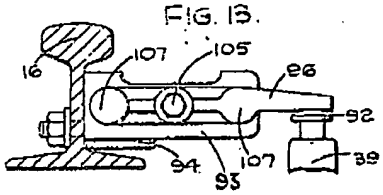
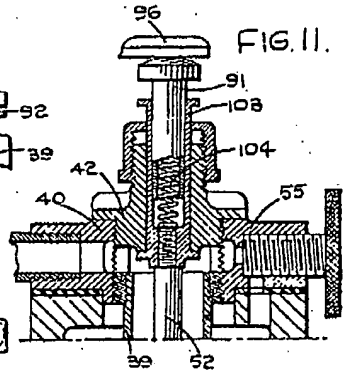


FIG. 11.



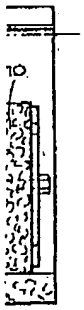


FIG. 14.

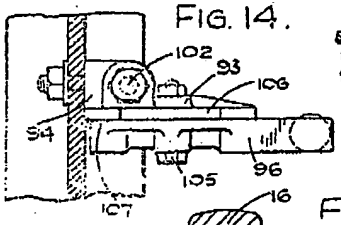


FIG. 15